REMARKS

Claims 14-27 are in this application. Applicants submit that amendments made herein are for clarifying purposes and are not intended to narrow the scope of the claims.

Claims 14, 16, 17, 18, 20-21, 23, and 25-27 were rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification.

Applicants respectfully disagree with the Examiner when she says the specification fails to teach how to form a hologram (a holographic stereogram) from the synthetic image and generate parallax images (a parallax image train). This is described in the Background section of the present application, and in the description of the related art. Also, Fig. 1 helps explain the process of formation that is prior art and accordingly, not claimed. See also, page 7, last paragraph of the specification. Applicants further submit that it is well known in the prior art that a hologram or holographic stereogram can be formed by generating a parallax image train (or sequence of parallax images), so that a (parallax) image seen by one eye differs from the (parallax) image seen through the other eye, thus producing the three dimensional effect (see, for example, MIT Media Labs' website mentioning that "holographic stereograms are generated from precomputed fringe elements and a set of rendered or optically captured parallax views of a scene").

Applicants also disagree with the Examiner that "[i]t is known in the art that there is no such thing as three dimensional image...," and submit that conventional means for generating a three-dimensional image exist in the prior art. Further, Applicants refer to the following reference regarding the need to differentiate "three-dimensional image" from "three-dimensional illusion." For example, McGraw-Hill Dictionary of Scientific and Technical Terms, Fifth Edition, 1994 provides a clear definition of the term "three-dimensional" as "**[g]iving the illusion of depth, in three dimensions**". Therefore, according to the dictionary, the word itself includes the meaning of giving illusion and that concerns three dimensions, even if there was not any real three dimensional thing, so there is no need for the image to exist by itself, as asserted by the Examiner.

Claims 14-16, 17, 18-20, 21-22, 23-24, 25, 26 and 27 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite.

The term "three-dimensional image model," as used in the claims of the present application, comprises a representation of at least a portion of an actual three-dimensional object.

In other words, "three-dimensional image model" means a three-dimensional image that constitutes a "model" onto which a two-dimensional image ("2D image"), for example, an image taken by a digital camera, is "pasted," or "combined." As illustrated in Fig. 6, and described at lines 3-10 of page 20 of the instant specification, the 3D head without the facial features (56a) is one example of the "three-dimensional image model" on which the 2D image of, for example, a person's face (57) is pasted. See also, page 16, second and last paragraphs; and page 17, line 9.

Further, Applicants have amended claims 14 and 17 so as to clarify the terms "generated image," and "captured image." For the term "image rendering" asserted by the Examiner as being indefinite, refer to the above mentioned citation to the MIT Media Lab, for example. Further, the term "omitted portions" means an image like the generated image in claim 14 or captured image in claim 17 that, when pasted or combined to the stereo image model, constitutes a complete image. For example, a figure of a face that may be either generated or captured (photographed) is the omitted portion of a stereo image model of a head, that when pasted or combined to the stereo image model (or three-dimensional image model), completes the desired three-dimensional image of the present invention. This is described in the specification at, for example, lines 3-10 of page 20; page 16, second and last paragraphs; and page 17, line 9.

Claims 15, 19, 22 and 24 were rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships.

Each of claims 15, 19, 22 and 24 recites, in part, "recording each image of the parallax image train as an element hologram on a sensitive material by exposing the sensitive material to an object beam and reference beam at the same time."

Applicants submit that the present application supports the above-quoted limitation at, in particular, lines 6-13 of page 14. See also, page 7 (lines 12, 14-19), page 8 (fourth paragraph), page 10 (last line), page 11, (first line), line 6 of page 14 to line 1 of page 15, and page 15 (lines 7-17).

Claims 14, 16, 17, 18, 20, 21, 23 and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by Tabata (U.S. Patent No. 6,111,597).

The present invention claims an apparatus and method in which a two-dimensional image taken from a photographic unit, such as, a digital camera, is "pasted" to a three-dimensional image generated by a 3D image source, as shown in Fig. 5. Such pasting,

performed in the image synthesizer 51, differs from the combining or inserting operation taught by Tabata (the reference cited by the Examiner; see column 27, line 38) in the following points.

The term "insertion," used in Tabata, means inserting a background image (a pair of 2D images) to a pair of 2D images of a target object, which is similar to superimposing two separate 2D images taken by a camera. On the other hand, "pasting," as performed in the present invention (illustrated in Fig. 6, and described at line 14 of page 16, to line 11 of page 17), means that a 2D image (57) is pasted on a three-dimensional image model (56a) in a 3D image (55), to then render the "combined" images to produce a parallax image train (59) (see also, the example described in lines 3-8 of page 20). Pasting does not require determining distances between two-dimensional images, as is required in Tabata's "insertion." Instead, Applicants' device combines a two-dimensional image to a three-dimensional image model. Accordingly, the terms "pasting" and "combining," as used in the present invention, are not analogous to the term "insertion" used in Tabata.

In addition, the term "rendering," as used in Tabata, is based on parameters of position or orientation of the two-dimensional image projection planes (column 9, lines 59-61), and, thus, differs from the term "rendering," as used in the present invention. With Applicants' device, "rendering" means producing a parallax image train from a synthetic image (page 16, line 9) that is generated by combining the three-dimensional object image with a two-dimensional image (page 16, lines 5-6).

In further contrast to "pasting," as performed in the present invention, the "background insertion process" described in Tabata (column 27, lines 47-48) is performed by creating separate 2D images of left and right eyes (see, for example, column 10, lines 35 to 37), which are displayed respectively in different displays provided in a head-mounted device (column 9, line 41). The three dimensional effect in Tabata is, thus, obtained by "projecting two images of the object on corresponding two-dimensional image projection planes, respectively, the projected images being viewed in a virtual three-dimensional space with the two eyes" (column 9, lines 53-57); "a three dimensional space image, which is formed when the left and right images described before...are displayed on the left and right display element screens [of the head-mounted device]" (column 12, 46-49). Such two images are made different for displays of the left and right eyes based on a depth distance (column 9, line 49) between the eyes and the target object (column 9, lines 46-49).

Also distinguishable from the "pasting" of the present invention, the "combining" in Tabata is performed by inserting "background image data concerning the background of the object" and supplying the "data obtained as a result of this process to the HMD" (column 10, lines 2-6).

Thus, in Tabata, the virtual three-dimensional space is recognized as a 3D image only when wearing the head-mounted device and displaying respective 2D images to each eye. On the other hand, viewing the 3D images according to the present invention requires neither a head-mounted device nor two displays displaying two different images for each eye. Instead, the present invention provides multiple (i.e., considerably more than two) element holograms arranged horizontally in succession (see page 15, lines 13-14), which are displayed (or printed) in one display (or recording medium).

Claims 15, 19, 22, 24, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Tabata in view of the patent issued to Benton (U.S. Patent No. 4,834,476).

Applicants further submit that because Tabata does not meet all the limitations of the independent claims of the present invention, the combination of Tabata and Benton is an insufficient basis for rejecting such claims.

Accordingly, Applicants submit that the present application is in condition for allowance. An early notice to this effect is respectfully solicited.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "**Version with markings to show changes made**."

The foregoing comments concerning the disclosures in the cited prior art represent the present opinions of Applicants' undersigned attorney and, in the event, that the Examiner disagrees with any such opinions, it is requested that the Examiner indicate where in the reference or references, there is the bases for a contrary view.

Please charge any fees incurred by reason of this response to Deposit Account No. 50-0320.

Respectfully submitted,

FROMMER LAWRENCE & HAUG LLP
Attorneys for Applicants

By: _____
William S. Frommer
Registration No. 25,506
Tel. (212) 588-0800

VERSION WITH MARKINGS TO SHOW CHANGES MADE IN THE CLAIMS:

Claims 14, 16, 17, 18, 21, 23, 25 and 26 are amended as follows:

14. (Amended) Apparatus for forming a hologram comprising:

an image generating section;

[synthesizing means for producing a synthetic image by pasting a generated image] an image synthesizing section for producing a synthesized image by combining an image generated by said image generating section onto a three-dimensional image model, wherein said three-dimensional image model comprises a representation of at least a portion of an actual three-dimensional object, and, after combination with said image generated by said image generating section, forms said synthesized image [is at least a portion of a three-dimensional object]; and

[generating means for producing] a parallax image train generating section for generating a parallax image train from said [synthetic] synthesized image.

16. (Amended) Apparatus according to claim 14, [wherein said generating means produces] wherein said image train generating section generates said parallax image train by rendering said synthesized [synthetic] image.

17. (Amended) Apparatus for forming a hologram comprising:

image capture means;

[synthesizing means for producing a synthetic image by pasting a captured image onto a three-dimensional image model, wherein said three-dimensional image model is at least a portion of a three-dimensional object] image synthesizing means for producing a synthesized image by combining an image captured by said capture means onto a three-dimensional image model, wherein said three-dimensional image model comprises a representation of at least a portion of an actual three-dimensional object; and

[generating means for producing] parallax image train generating section for generating a parallax image train from said [synthetic] synthesized image.

18. (Amended) Hologram forming apparatus comprising:

first image generating means for generating an image train of an image of an actual three-dimensional object, said image including a three-dimensional model comprising a representation of at least a portion of said actual three-dimensional object [at least on a portion thereof];

second image generating means for generating an image train of a separate image; and

[synthesizing means for producing] parallax image train generating means for generating a parallax image train by pasting the image train of the separate image to the three-dimensional model of said image train of said image of a three-dimensional object.

21. (Amended) Hologram forming method comprising the steps of:

generating an image;

[producing a synthetic image by pasting a] producing a synthesized image by combining the generated image onto a three-dimensional image model, wherein said three-dimensional image model comprises a representation of at least a portion of an actual three-dimensional object [is at least a portion of a three-dimensional object]; and

[producing] generating a parallax image train from said [synthetic] synthesized image.

23. (Amended) A method for forming a hologram comprising the steps of:

generating an image train of an image of an actual three-dimensional object, said image including a three-dimensional model comprising a representation of at least a portion of said actual three-dimensional object [at least on a portion thereof];

generating an image train of a separate image; and

[producing] generating a parallax image train by pasting the image train of the separate image to the three-dimensional model of the image train of the image of the three-dimensional object.

25. (Amended) A hologram having recorded therein a parallax image train [produced from a synthetic image produced by pasting] generated from a synthesized image produced by combining a generated image onto a three-dimensional image model, wherein said three-dimensional image model comprises a representation of at least a portion of an actual three-dimensional object [is at least a portion of a three-dimensional object].

26. (Amended) A hologram having recorded therein a parallax image train [produced] generated by pasting an image train of a separate image to a three-dimensional model of an image train of an image of an actual three-dimensional object, wherein said three-dimensional image model comprises a representation of at least a portion of the actual three-dimensional object.